PIBS 599B

Ministry of Environment and Energy

FOR YOUR information

JULY 1995

Class 1, 2 and 3 Sewage Systems

INTRODUCTION

Most sewage from our municipalities is processed through municipally-owned sewage treatment plants. However, where municipal sewage plants are not available, privately owned systems do the job. The legislation relating to such systems is contained in Part VII of the Environmental Protection Act and the standards for the sewage systems are provided in Ontario Regulation 374/81.

Many privately owned sewage systems treat and dispose of the sewage from building(s) served in a class 4 (septic tank) or class 6 (aerobic packaged treatment plant) sewage system. Together with the municipal plants these two systems treat and dispose of over 90 per cent of Ontario's sewage.

There are, however, situations where a simpler sewage disposal system may be adequate. These situations exist in temporarily occupied hunting cabins and cottages, or where the use of a class 4 sewage system is difficult, costly, or impractical for other reasons.

CLASSIFICATION

Simple sewage-disposal systems are classified as:

Class 1: Chemical toilets, incineration toilets, recircculating toilets, self-contained portable toilets and all forms of privies including portable privies, earth pit privies, pail privies, privy vaults and composting toilet systems. These are used only for the disposal of human body wastes.

Class 2: Leaching pits. These are used only for the disposal of sewage other than body wastes.

Class 3: Cesspools. These are used for the disposal of the contents of class 1 toilets or effluent from leaching beds constructed prior to April 16, 1974.

DEFINITIONS

The term "sewage" means waste of domestic origin including body and other liquid wastes from showers, tubs, laundry facilities, washrooms and kitchen sinks. Collectively, these are called "grey water".

APPROVALS

A certificate of approval or use permit is not required for a class 1 sewage system. For class 2 and 3 sewage systems, a certificate of approval must be obtained before construction of the building begins. These can be obtained from the local health unit or, in a few areas, from the local Ministry of Environment and Energy office (MOEE).

LOCATION

The clearance distances for class 1, 2 and 3 sewage systems from various features such as wells, springs, bodies of water are given in Table 1 (page 4).

CLASS 1 SEWAGE SYSTEMS

An outline and general description of various class 1 toilets are given in table 2 and figure 1 on page 5 and 6.

These systems are used only for the disposal of human body wastes, although chemicals used to mask odours may be added. Vegetables and other biodegradable matter may also be added to composting toilets in accordance with the manufacturer's instructions.

Waterborne sewage, or grey water, cannot be disposed of in a class 1 sewage system. Class 1 sewage systems are approved only if another system is provided to handle the grey water. This second system is commonly a class 2 sewage system leaching pit.

The use of a class 1 and class 2 sewage system with new construction is generally discouraged. Because of the limited capacity of the class 2 sewage system, this combination usually will not provide for the full development of the dwelling served. The combination may be approved where the water use is minimal, such as where water is hand pumped or the pressure water system serves a limited number of fixtures such as the kitchen sink and a hand basin (see more on class 2 sewage systems below).

A class 1 sewage system may be a viable alternative to the expansion of an overloaded septic tank system. By using a class 1 sewage system the overall sewage flow from the house to the septic tank may be reduced by as much as 20 to 30 per cent; a reduction often sufficient to allow the existing system to continue operating without overloading or failure.

Where guest houses or cabins are used for sleeping only, and all other activities, such as bathing and cooking are carried out in the main building, the use of a class 1 sewage system for the sleeping quarters may be permitted.

For a typical design of a pit privy see Figure 2 on page 7.

CLASS 2 SEWAGE SYSTEMS

Leaching pits (Class 2 sewage systems) are designed to receive and treat grey water only. Since their ability to handle even a limited flow depends on favourable soil conditions, they are generally not able to handle the disposal of grey water from showers, baths, washing machines, dishwashers or garburetors.

Leaching pits may be used in combination with a class 1 sewage system at the discretion of the approving director.

DESIGN

The following design requirements for class 2 sewage systems are contained in the Ontario Regulation 374/81, Section 8(2).

1. The bottom of the pit shall be at least 0.5 metres above the high groundwater table.
2. The pit shall be constructed in such a manner as to prevent the collapse of its sidewalls.
3. Any material used to support or form the sidewalls of the pit shall be an open jointed material of a type that will permit leaching from the pit.
4. The pit shall be provided with a tight, strong cover that shall remain over the pit except when it is necessary to remove it to add or remove sewage from the pit, or for the maintenance of the pit.
5. The earth around the perimeter of the pit shall be raised or mounded to a height of at least 0.15 metres above the ground level.
6. The surface of the ground in the area of the pit shall be so graded that the surface drainage in the area will be diverted away from the pit.
7. The pit shall be surrounded on all sides and on its bottom by at least 0.6 metres of earth.

The design of a leaching pit depends on the permeability of the soil and the expected volume of grey water to be treated. In sizing a leaching pit the only sidewall area considered effective is that below the bottom of the inlet pipe.

The sidewall should not be subject to a loading, in terms of litres per square meter per day (L/m^2d), in excess of 400/T, where T is the percolation time in minutes per centimetre of the soil under and surrounding the pit.

Once the sidewall area is determined, it can be provided by either a shallow pit of large perimeter or a deeper pit of smaller perimeter. If adequate soil depth is available, the latter is more practical, as it reduces the size (and weight) of the cover, or cover sections.

Since the liquid entering the surrounding soil must disperse downwards or laterally without breakout to the surface, the pit and its surrounding soil should not be located in a depression which collects run-off and drains slowly.

The per capita flow of grey water may range between 20 to 140 litres per day. The daily sewage flow to the pit will depend on the number of occupants, the type of fixtures available and the use of any pressurized water supply. Once a decision is made on the grey water flow and the soil percolation rate is established, the size of the leaching pit can be determined by:

- calculating the permissible soil loading as follows:
  soil loading in $L/m^2 \cdot d = 400/T$
- finding the sidewall area required below the inlet pipe as follows: sidewall area (m^2) = Q/loading = QT/400; and
- determining the perimeter measurement, depth and shape that will suit the location on the property and will provide the required sidewall area.

A rectangular pit with adequate sidewall area and an easily removable cover is recommended.

If a very low value of T is used, the sidewall area determined from the formula QT/400 will be very small. A pit designed on this basis would have excessively high sidewall loading. This could result in problems with the dispersal of the liquid into the surrounding area. To avoid such loadings the design value of T should not be less that four.

Example:

Assume a soil of T = 10 min/cm and a two-bedroom cottage with two persons per bedroom. If the per capita design flow is 40L/d then:

Loading = $400/T = 400/10 = 40 L/m^2 \cdot d$

Sidewall area = $\frac{40 \times 2 \times 2}{40} = 40\ m^2$

If the overall depth to the bottom of the pit is 1.2 metres, and there is 0.8 m below the inlet, the pit perimeter will be 4/0.8 = 5m. A rectangular pit 1.5 m metre in length and 1 metre in width would be adequate.

For details of a typical class 2 sewage system see Figure 3 on page 8.

CLASS 3 SEWAGE SYSTEM

A class 3 sewage system shall receive or be used only for the disposal of the contents of a class 1 sewage system, or effluent which has passed through a leaching bed in use before April 16, 1974. The design of a class 3 sewage system is the same as for a class 2 sewage system. A design for a typical class 3 sewage system is shown on Figure 4 on page 9.

PREFABRICATED SEWAGE SYSTEMS

Class 1 and class 2 sewage systems may be prefabricated and sold by manufacturers or their agents. This is particularly true for class 1 composting toilets, incinerating toilets and chemical toilets, a large number of which are on the market.

Although manufacturers often ask the ministry to "approve" their propriety systems, MOEE does not conduct a testing program of the "consumer report" type to determine the efficiency or reliability of the units.

The ministry does review data submitted by the manufacturer to ensure that the class 1 classification is appropriate, and if it is, the manufacturer of his agent is so advised by letter. Matters concerning conditions of use and acceptable advertising claims are also stated. For example, since class 1 toilets only dispose of human waste, they should not be advertised as a solution to all sewage disposal problems; the grey water requires a separate system.

There are no approved proprietary class 2 sewage systems. The regulation contains standards for class 2, 4, 5 and 6 sewage systems that may be used for grey water disposal.

TABLE 1

LOCATION OF CLASS 1, 2 AND 3 SEWAGE SYSTEMS
(Clearances measured horizontally in metres)

COLUMN 1	COLUMN 2	COLUMN 3	COLUMN 4
Type of system	Well with a watertight casing to a depth of at least 6 metres.*	Other well, or a spring used as a potable water supply.	Lake, river, pond, stream, reservoir, or a spring not used as a potable water supply.
Class 1			
Pit privy Privy Vault)	15 m	30 m	15 m
Pail Privy)	10 m	15 m	10 m
Class 2			
Leaching Pit	10 m	15 m	15 m
Class 3			
Cesspool	30 m	60 m	15 m

**Information on the depth of casing is available from the well drilling logs of the ministry and can be obtained from the Water Resources Branch.*

TABLEAU 1

EMPLACEMENT DES SYSTÈMES D'ÉGOUTS DES CLASSES 1, 2 et 3
(Espacements mesurés horizontalement en mètres)

COLONNE 1	COLONNE 2	COLONNE 3	COLONNE 4
Genre de système	Puits pourvu d'un chemisage étanche jusqu'à une profondeur d'au moins 6 mètres.*	Autres puits, ou source utilisée pour l'approvisionnement en eau potable.	Rivière, lac, étang, ruisseau, réservoir ou source ne servant pas à l'approvisionnement en eau potable.
Classe 1			
Latrine à simple trou Latrine à fosse fixe	15 m	30 m	15 m
Latrine à fosse mobile	10 m	15 m	10 m
Classe 2			
Puits absorbant	10 m	15 m	15 m
Classe 3			
Puissard	30 m	60 m	15 m

**Tous les renseignements sur la profondeur des chemisages sont donnés dans les rapports de forage du ministère et peuvent être obtenus auprès de la Direction des ressources en eau.*

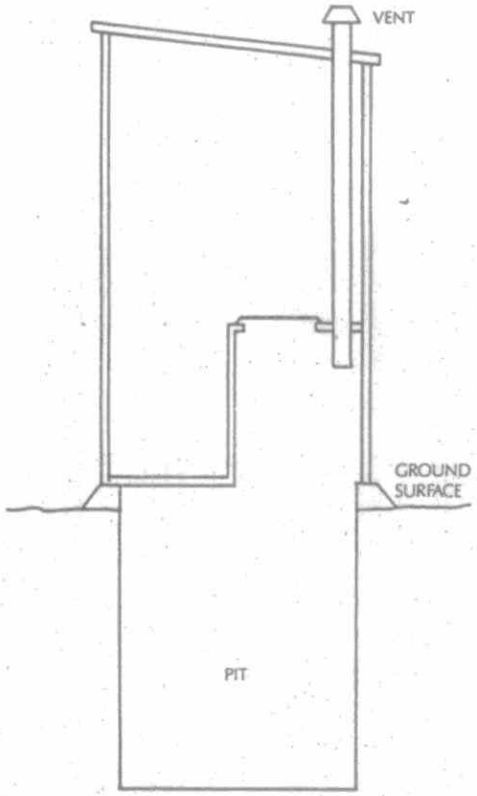
TABLE 2

CLASS 1 SEWAGE DISPOSAL SYSTEMS

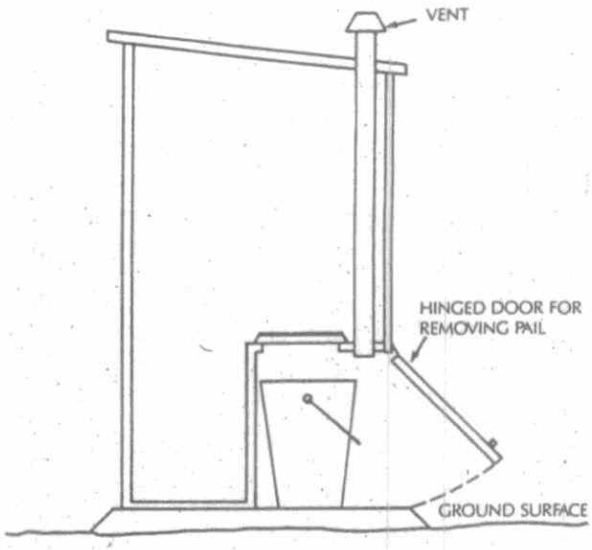
Class 1 systems are used only for the disposal of human body wastes and provision must be made to dispose of waste water to a separate sewage system. The conditions under which Class 1 systems are usually permitted are:

1) Where the installation of standard septic tank and tile bed is not possible due to lot conditions
2) Where provision is made for the adequate disposal of the waste water to a completely separate system. Class 1 systems are not usually permitted if a premises is served by a pressure water system, as seepage pits usually can not adequately handle large flows.

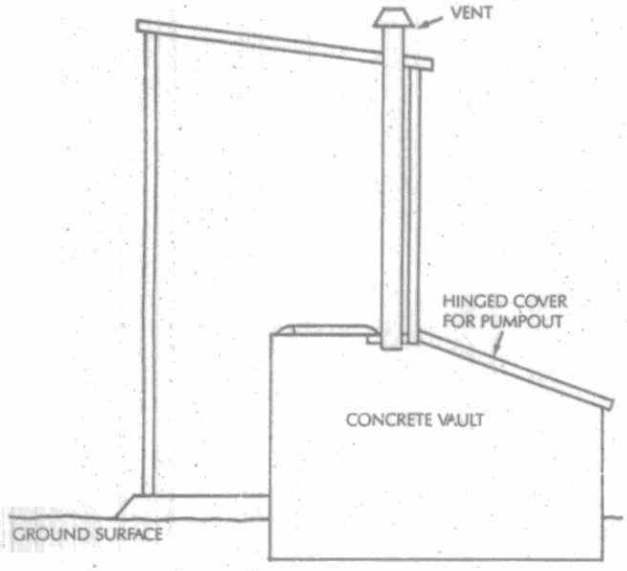
FACILITY	SUITABILTY	LOCATION	CONSTRUCTION	MAINTENANCE
Earth or Pit Privy	Where soil available and groundwater not encountered. Bottom of pit should be 3' above water table, rock or impermeable soil.	Minimum distances: 15 m from cased well 30 m from dug well 15 m from river, stream, lake, pond, etc. Should be located downgrade from well.	Deep pit, insect and rodent proof. Earth mounted to prevent infiltration or surface water. Pit ventilated.	Good housekeeping required. Natural decomposition of waste should be relatively odourless.
Vault Privy	Where adequate soil not available for pit privy and protection of ground water is required.	Minimum distances: 10 m from cased well 15 m from dug well 10 m from river, stream, lake, pond, etc. Should be located downgrade from well.	Watertight concrete vault. Flytight building. Ventilated vault and building. 15 cubic metres/person/year.	Keep clean, flytight. Clean pit when contents approach within 0.5 m of door. Disposal of contents to a Class 3 or 7 system.
Removable Pail Privy	A temporary facility to protect water supply. Where pit privy is impractical.	Minimum distances as per vault privy.	As per vault privy. Provide easily-cleaned pails.	Provide regular collection service and cleaning facilities, including hot water, long-handled brushes, detergent, drained concrete floor. Disposal of contents to Class 3 or 7 system.
Incinerating Toilets & Composting Toilets	To protect ground water and surface water supplies.	Indoors or adjoining main residence. Should not be used in close proximity to neighbours.	Unit requires a power source. Incinerating toilets also have a cycle time during which they can not be used.	Incinerated ash or dry compost may be disposed of easily: on garden, or buried.
Chemical toilet	To protect underground and surface water supplies.	Indoors or adjoining main residence.	As for masonry vault privy. Tan, may be heavy gauge metal with protective coating. Capacity 550-1150 litres.	Use 30 grams of lye for each cu. ft. of vault capacity. Made up to liquid depth in vault or 11 kg caustic soda per seat in 70 l water. Maintain chemical solution proper strength to keep odours down and agitate after each use. Clean vault when ⅔ - ¾ full. Avoid splashing as solution causes burns.



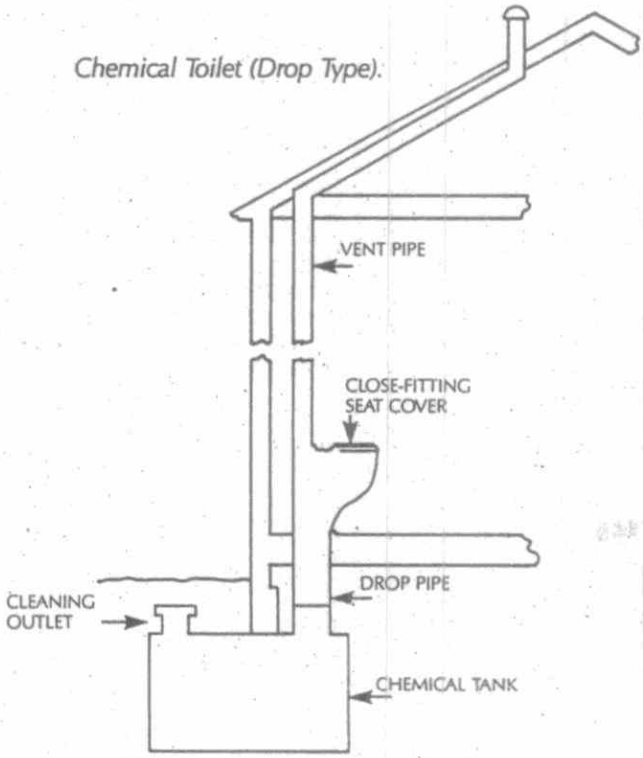
Pit Privy.



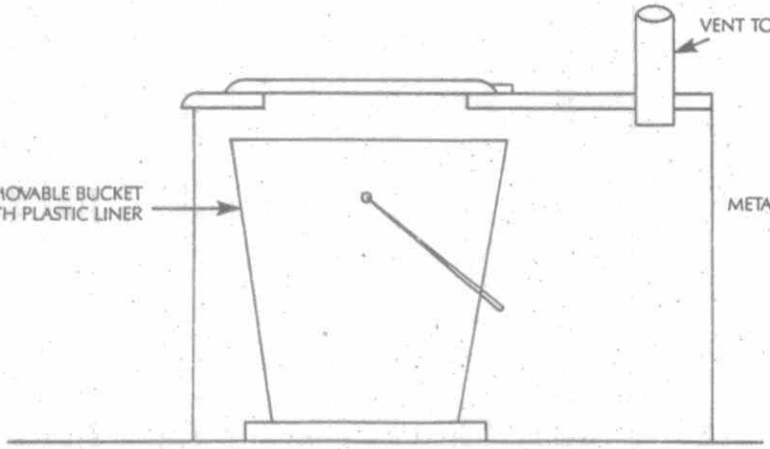
Pail Privy.



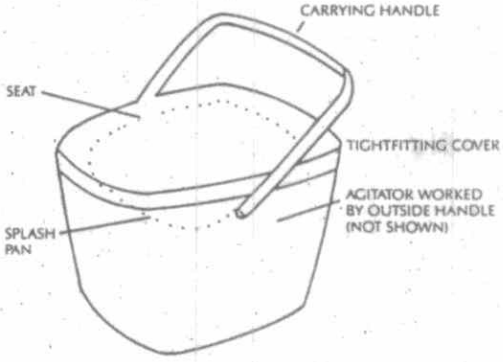
Vault Privy.



Chemical Toilet (Drop Type).



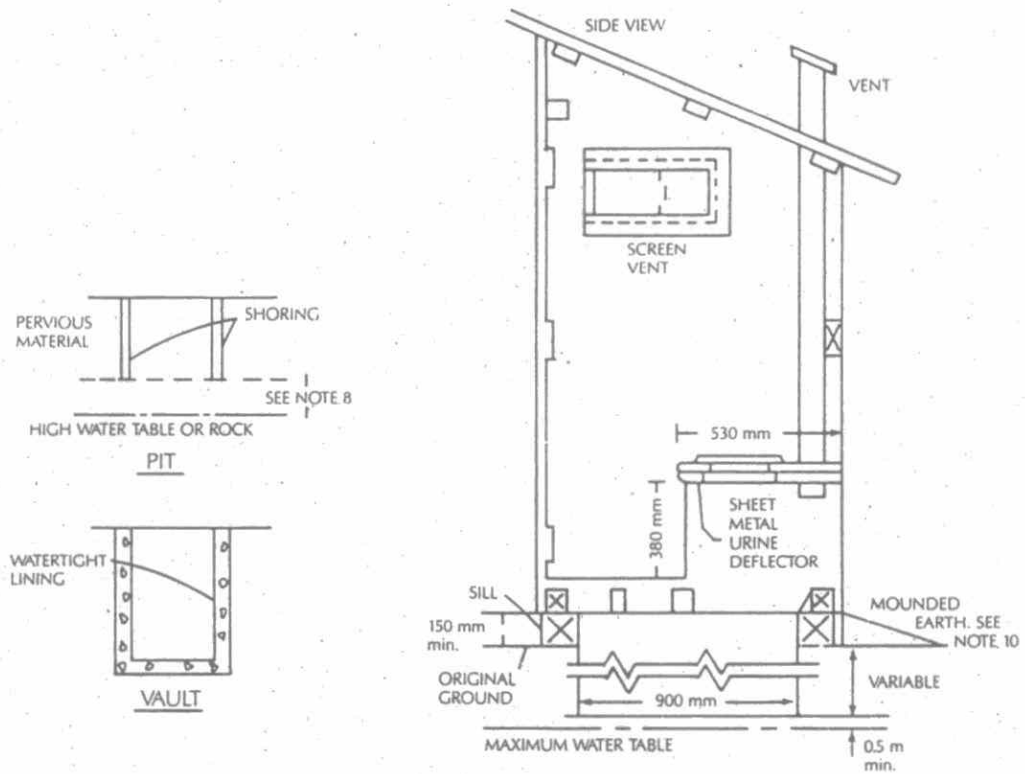
Chemical Toilet (Bucket Type).



Portable Chemical Toilet.

FIGURE 1

FIGURE 2

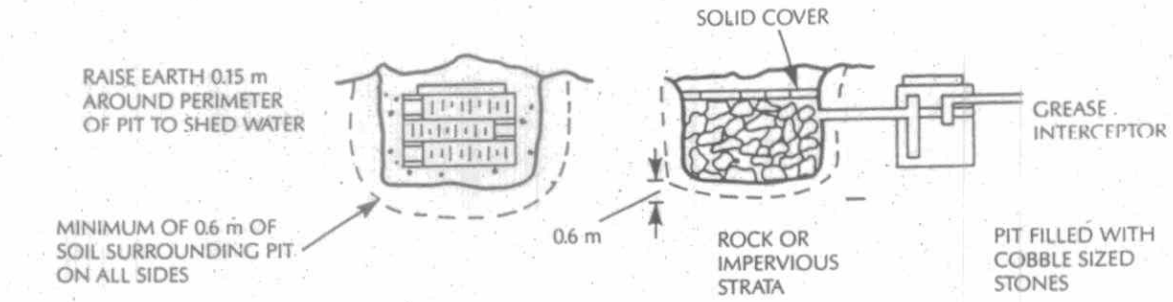


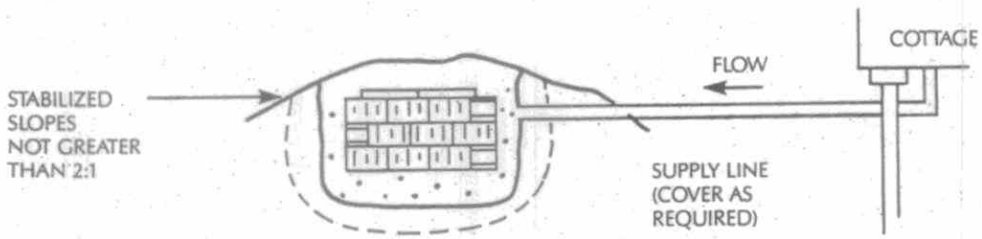
Note

1. Superstructure to be constructed of strong durable weather-proof materials.
2. Solid floor supported by a sill.
3. Equipped with one or more seats having covers supported by an enclosed bench.
4. Self closing door, at least one screened window for ventilation.
5. Bench or riser to be lined with an impervious material on all interior vertical surfaces.
6. Ventilating duct, screened at top, shall extend from underside of the bench to a point above the roof.
7. Sides of pit of pit privy shall be shored to prevent collapse.
8. Pit of pit privy shall be surrounded on all sides and on bottom with 0.6 m of earth and bottom of pit shall be at least 0.5 m above high water table.
9. Vault of vault privies shall be watertight.
10. The ground around all privies shall be graded to promote surface runoff away from privies and the bottom of the surface structure shall be at least 0.15 m above the surrounding ground.
11. The portable privy shall have a superstructure similar to other privies but it must be constructed to withstand the stresses subjected to it while loading and transporting it.
12. The portable privy must have a watertight receptable for the storage of the sewage and it must be designed so that it can be easily cleaned and emptied.
13. Bottom metre of plywood structure should be covered by asphalt shingles or other suitable material to prevent animals from gnawing the wood.
14. Pit should provide an effective volume of 0.06 cu. metres/person/year for year round use.
15. Approximate dimensions 1 metre wide x 1.3 metres deep x 2.5 metres high. Pit to be 1 m x 1 m with variable depth.

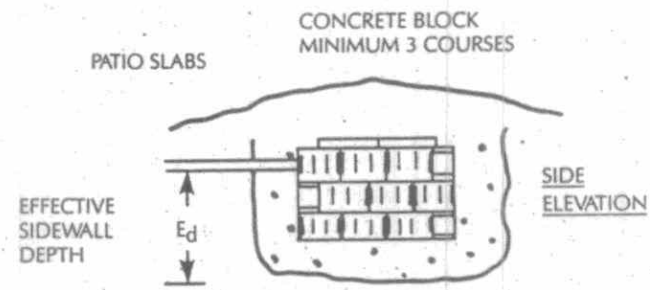
CLASS 1 SYSTEM PRIVIES

FIGURE 3

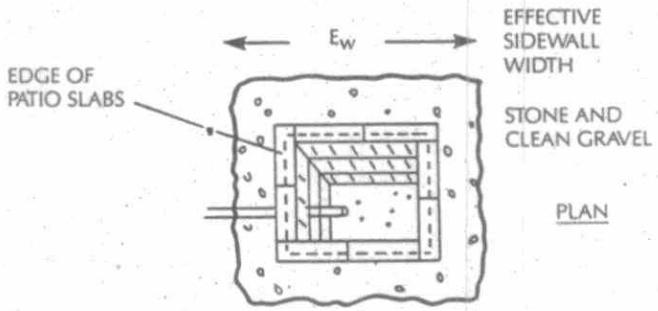




RAISED LEACHING PIT



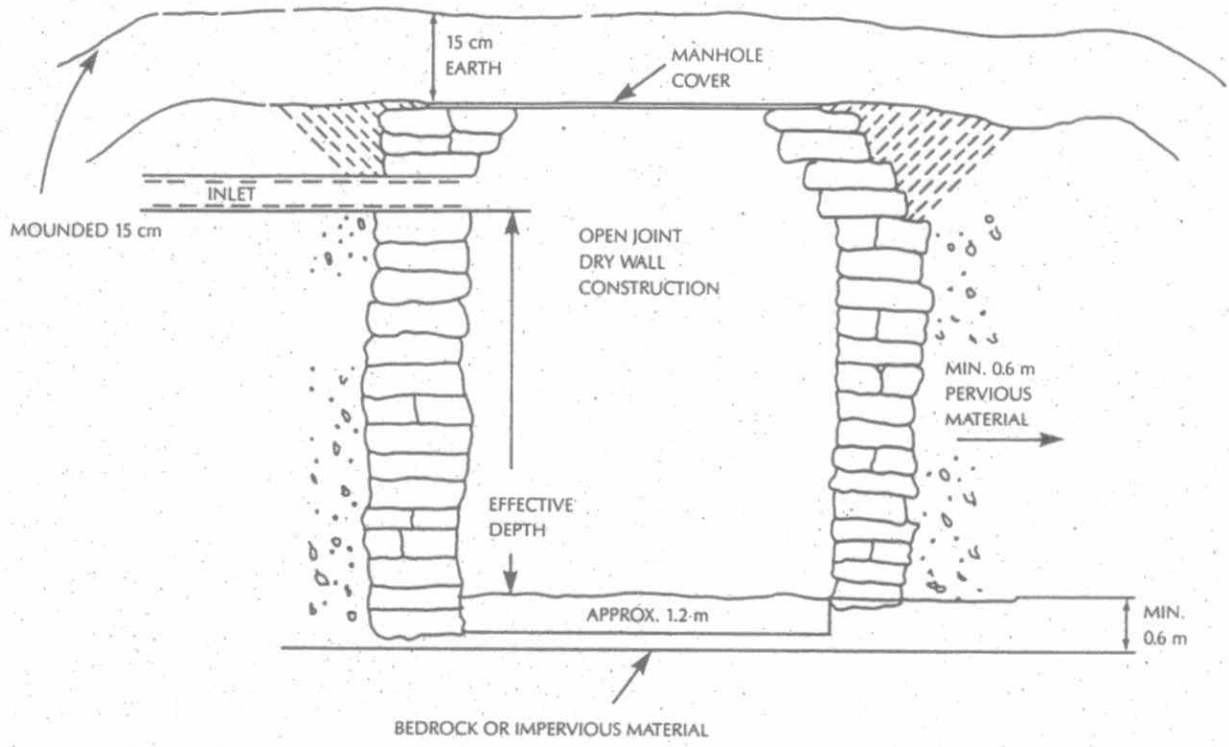
STONE AND CLEAN GRAVEL FILL UNDER BLOCKS AND BETWEEN BLOCKS AND SIDES OF PIT



DETAILS: TYPICAL CONCRETE BLOCK LEACHING PIT

CLASS 2 SYSTEM
TYPICAL LEACHING PITS

FIGURE 4



NOTE

1. Bottom of pit must be at least 0.6 m above bedrock or impervious layer.
2. Side of pit must be constructed to prevent collapse and be of material to permit leaching into the surrounding soil.
3. Sides and bottom of pit to be surrounded by at least 0.6 m of permeable material.
4. Earth around the perimeter to be mounded at least 15 cm above surrounding ground level and whole area graded to divert surface water away from the pit.
5. Pit must have a tight strong cover in place at all times except when adding or removing sewage or repairing system.
6. Pit must be at least 30 m from a well with a 6 m casing, 60 m from any other well and 15 m from any lake, pond, river, spring or reservoir.

TYPICAL CESSPOOL